Protecting Harpswell's Marine Resources

A Report to the Town of Harpswell

Prepared for the Town of Harpswell

Conservation Commission
and
Marine Resources Committee

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Acknowledgement

This project would not have been possible without the help of the volunteers who devoted several Saturday mornings to hike the four site areas, survey land uses, map drainage areas, and who tried to stay dry despite some inclement weather. The recommendations of this report are based on their observations and suggestions at the field sessions and subsequent work sessions. To this end, the Conservation Commission, the Marine Resources Committee and the technical staff gratefully acknowledge the efforts of the following people:

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Preface

This study was made possible by a grant to The Town of Harpswell's Conservation Commission and Marine Resources Committee from the Maine Department of Environmental Protection under Section 604(b) of the Clean Water Act. The purpose of the grant was to evaluate Harpswell's shellfish resources and recommend protection measures. The technical team of Chris Heinig, a marine biologist; Amy Naylor, a land use planner; and Don Newberg, a hydrogeologist was hired to review and help modify the project Work Plan, coordinate field studies of the four selected shellfish areas, and prepare the final report. Nineteen volunteers assisted with the field work.

One of the original ideas of the project was to identify which of Harpswell's 43 shellfish areas were of most importance to the Town and apply the management recommendations to those areas. However, as the project progressed it became clear to the Commission and the technical team that all of Harpswell drains into marine waters and therefore, the recommendations should apply Townwide.

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Executive Summary

Site walks were conducted by teams consisting of members of the Harpswell Conservation Commission and Marine Resources Committee, volunteers from the Town, and the technical consulting staff in the drainage basins associated with each of four shellfish areas selected as representatives of a range of common geological and land-use conditions found throughout Harpswell. The drainage areas were examined and the existing and potential pollution problems noted for each site. Each site was mapped with details of stream patterns, water courses, and shellfish areas. Written surveys were made regarding land coverage, development density, and impervious surface, as well as the location of streams, culverts, and septic systems.

Based on the surveys, five major areas of concern were identified: A) public and private ***road construction and maintenance***; B) ***construction standards*** for all types of construction, including level of initial review and approval and enforcement of conditions of approval; C) changes in the ***intensity and types of land use***, more specifically, the "over-utilization" of land such that the pollutants generated by the use cannot be absorbed on site and run off into nearby surface water of other properties; D) the continued ability of existing ***wetlands and vegetative buffers to function as "shock absorbers"*** for the additional stress that is being placed upon them; and finally, E) the impact of the recent changes to the ***Maine State Plumbing Code***, is also discussed as it may place additional pressure on already fragile coastal resources.

Recommended solutions for each of these areas of concern are suggested and generally take the form of ***education*** for residents, builders and others whose activities impact land-use; strengthening of the ***enforcement of existing federal, state and local regulations***; and adoption of ***new regulations***. It is important to note that the technical staff has taken the position that Harpswell residents will generally not knowingly pollute and, if made aware of the consequences of their actions, will take steps themselves to change activities that are harmful to marine resources. Further, where existing regulations are not being adequately applied, it may not appropriate to adopt new regulations. However, if existing regulations and/or educational efforts do not appear to be working, it may be necessary to consider additional regulations.

1. Introduction

Over the past thirty years Harpswell has seen unprecedented growth, both in population as well as in the number of housing units.

Source: U.S. Census Data/Harpswell Comprehensive Plan Revision, 1993

This development, along with the increased human activity associated with it, pose new threats to our surrounding waters and the resources they contain, many of which form the economic base of our community's fishing industry. Despite the current lull in development resulting from the economic downturn of the early 1990's, the rapid pace of development of the mid- and late-1980's will almost certainly be repeated if and when the general economy rebounds. The challenge before us is to properly and responsibly guide future development to insure that the high quality of our marine waters is maintained and that our natural marine resources are protected.

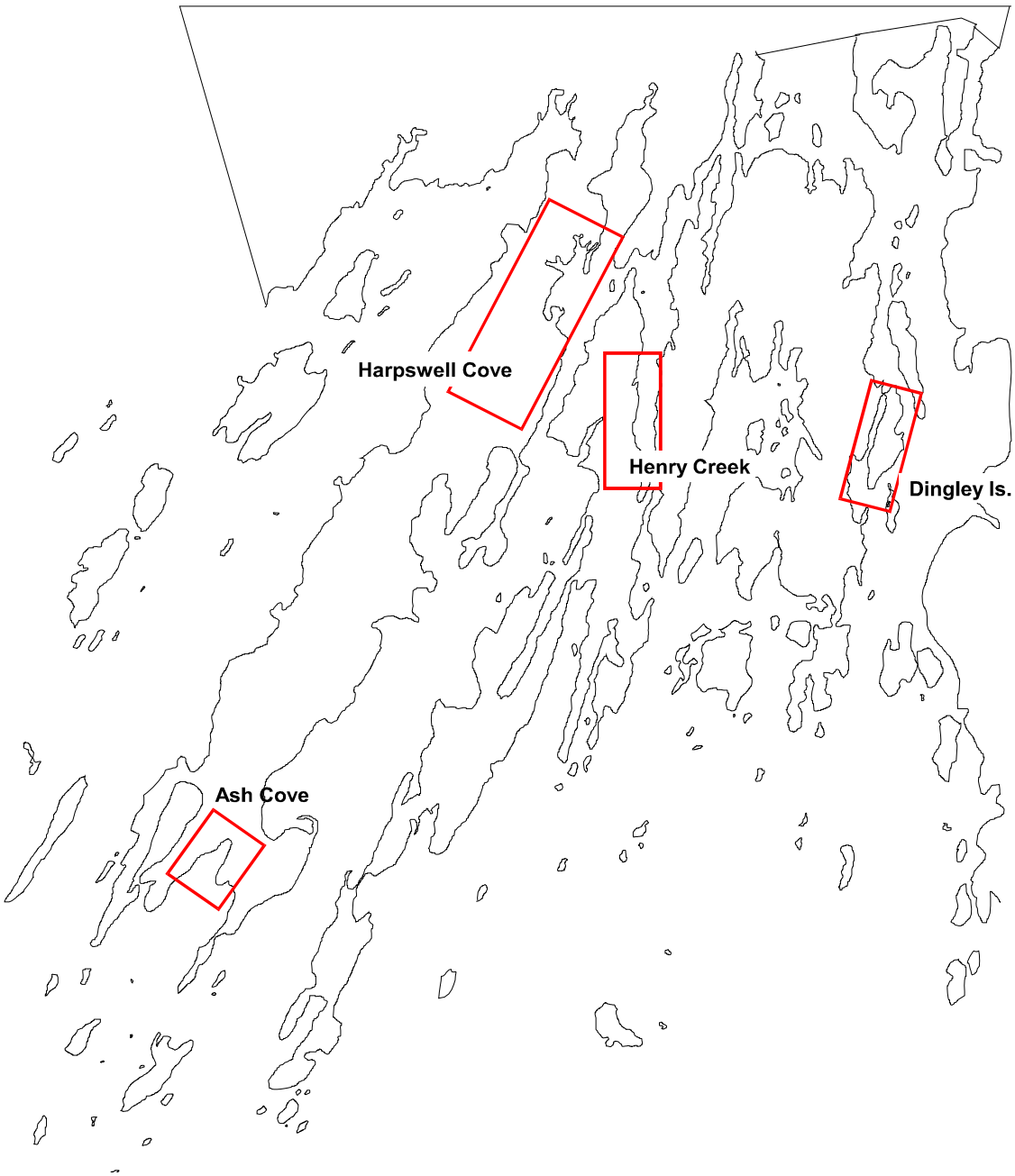
As an island town, Harpswell is surrounded by water. It is also transected by numerous surface water streams, both perennial and intermittent, that drain into its coastal waters. Because Harpswell is scarcely more than one mile across at its widest point, it is safe to say that almost anything that reaches these surface waters eventually finds its way to the shore. As

a result, land-use activities, especially those that occur near streams, have particular impact on the quality of Harpswell's marine waters. Simply put, what happens to Harpswell's marine resources is affected by what is happening on the land and the connection is surface water.

Together with the teams of volunteers the technical consulting staff walked four drainage sites representing common conditions found throughout Harpswell. These four areas are shown on the Location Map on the following page. The drainage areas were examined and the existing and potential pollution problems noted for each site. Each site was mapped with details of stream patterns, water courses, and shellfish areas. A written survey was made for each parcel noting a wide variety of land-use items such as vegetative cover, location of septic systems, the amount of impervious surface, and general activity, both residential and commercial. The intensity of use was also noted. These maps and the survey worksheets are on file at the Harpswell Town Hall.

Town of Harpswell, Maine

Location of Study Areas



2. Issues and Solutions

Based on the surveys, five major areas of concern were identified: 1) public and private ***road construction and maintenance***; 2) ***construction standards*** for all types of construction, including level of initial review and approval and enforcement of conditions of approval; 3) changes in the ***intensity and types of land use***, more specifically, the "over-utilization" of land such that the pollutants generated by the use cannot be assimilated on site and thus impact nearby surface water or other properties; 4) the continued ability of existing ***wetlands and vegetative buffers to function as "shock absorbers"*** for the additional stress that is being placed upon them; and finally, 5) the impact of the recent changes to the ***Maine State Plumbing Code*** is also discussed, since these may place additional pressure on already fragile coastal resources.

In the following, each area of concern is described. Its relation to marine resources is outlined and solutions are proposed. Based on discussions with volunteers and the policies of Harpswell's Revised Comprehensive Plan, solutions are divided into three categories. Generally, these categories include ***education*** for residents, builders and others whose activities impact land-use; strengthening of the ***enforcement of existing federal, state and local regulations***; and adoption of ***new regulations***. The technical staff takes the position that Harpswell residents will generally not knowingly pollute and, if made aware of the consequences of their actions, will take steps themselves to change activities that are harmful to marine resources. Further, where existing regulations are not being adequately applied, it may not make sense to adopt new regulations. However, if existing regulations and/or educational efforts do not appear to be working, it may be necessary to consider additional regulations. Finally, we also strongly advise that any recommendations adopted from this report be evaluated within three years.

2.1. Public and Private Road Construction and Maintenance

For the most part, roadway drainage in Harpswell consists of surface ditching. Water from the road and surrounding upland flows into ditches which then drain directly into nearby streams or wetlands. As noted above, Harpswell's island status means that nearly all fresh water flow soon finds its way into marine waters, potentially affecting our marine resources.

Stormwater carries a surprising variety of pollutants including numerous hydrocarbons, such as oils and greases, salt, lead, copper, cadmium and chromium, to mention only a few. Sediments are also a problem because changes in sediment load and content affect the benthic, or bottom-dwelling, community which includes the shellfish. The site walks showed that virtually every public and private roadway had moderate to severe clogging of ditches and culverts. Evidence that ditches had been dug out only to refill with sediment, was common. It was apparent that public road maintenance consists of digging out accumulated sediments from winter plowing and sanding, usually leaving a steep sloped, V-shape trench. No sedimentation and erosion control was found.

The result of such road maintenance is increased water flow for a short period. However, the steeper slope caused by the V-shaped trench results in faster water flow which, with the absence of vegetation, actually increases siltation. At each location, clear evidence was found of eroded ditches and banks with siltation. A classic example was found along Route 123 where the ditching had cut into residential property and caused erosion of the front lawn. Vegetation was minimal and the trench drained directly into a wetland.

Private roads fared no better than public roads with respect to drainage. Little erosion or sedimentation control was evident. In one particular location, two small drainage ponds have been constructed to catch accumulated flow from an unpaved access road. The ponds have begun to seed themselves but in periods of heavy rain it appears that stormwater flow could be heavy enough to cause additional siltation of the ponds which would then have to be excavated. The flow from the ponds goes through a culvert, under the road, and into a small stream. The additional flow from the culvert has caused the stream to erode its banks. In other situations private lot owners have dug culverts from their roof drains directly to road culverts, thus adding to the stormwater flow. The road culvert, which is meant to take drainage from the road only, is therefore now serving as an all purpose stormwater channel which funnels into a surface stream.

Road construction problems mirror road maintenance problems, with erosion and sedimentation control being the chief concern. The use of seed and mulch under fabric blankets, protective buffer strips and hay bales, properly sized culverts and flow control measures become critical for water quality protection in Harpswell. The site walks showed little sedimentation or erosion control measures in place for newer roads, however we did not visit sites with construction actually taking place.

The *size* of residential roads is also of some concern. Like many small towns, Harpswell is still using suburban right-of-way widths as a standard for private residential roads. Wider roads result in greater impervious surface, more use of salts and chemicals during winter clearing, and causes more runoff. We strongly advise a review of the current subdivision requirement that rights-of-way be 50 feet in width. While a 50' right-of-way may be advisable in order to accommodate utilities, such as power lines, snow storage, etc., reduced paving widths should be considered.

Last, some communities have found that paving is not always necessary for rural roads. An unpaved road usually has better stormwater absorption capacity than a paved road and may reduce ditch and culvert flooding. Unpaved roads are also less expensive to construct than paved roads. It should be emphasized that there must be construction standards for gravel roads as well as for paved roads.

Solutions

Education:

1. Technical training should be offered to road construction and maintenance personnel. The Maine DOT presently has a training program called "Maine Local Roads". This program is operated out of the Technology Transfer Program, known as T2. Local road crews can sign up for courses on road maintenance techniques, including sedimentation and erosion control methods. The classes are $25 per person. The program director is Peter Coughlan. He can be reached at 207-287-5663. Discussions with the Road Commissioner indicate a willingness to attend such classes so long as the Selectmen include attendance as part of the job requirement. 2. The Casco Bay Estuary Project (CBEP) plans to offer technical assistance to road crews in coastal areas. This program has not been finalized and CBEP is presently working with the T2 Program described above. In the near future, a demonstration project for local technical assistance may be funded by the Project. This demonstration program will include road maintenance training. The contact person at CBEP is Sherry Hanson at 207-828-1043.

Neither of these training programs will *certify* participants. However, the Road Commissioner may wish to consider participation in a road maintenance program as a requirement for all highway crew.

3. The Harpswell Selectmen are strongly urged to consider appointing a Town committee to coordinate with the CBEP and Department of Environmental Protection (DEP) on a coastal road construction and maintenance technical program. The program should include at a minimum: information on the impact to coastal waters and their resources of salt, sand, chemicals, poor ditching, and lack of proper sedimentation and erosion control methods. A video and/or handbook or a 2-3 hour class should result from this program so new road crew members and private contractors can easily access the information and apply it to their jobs.

As noted earlier, the CBEP is now working on an educational program for road construction and maintenance in coastal areas. It is possible that funds could be obtained from CBEP or DEP to implement this project. Once completed, contractors and new road crew members should be required to show proof of attendance at the class as part of their job performance or permit application.

Strengthening of Existing Regulations

4. Involve the Road Commissioner and Codes Enforcement Officer (CEO) in site reviews and inspections to ensure that construction and erosion and sedimentation control standards are met. The assessor might also be involved as part of the inspection team to ensure that roads are accurately plotted on Town maps. Require their review and comment on planning board applications.

5. Increase the enforcement of existing regulations and the level of site inspection during and after construction. This may mean hiring additional staff or requiring proof of compliance from applicants and contractors. It may require a change in the way in which permits are granted. For example, permits could be granted in stages, with the applicant required to show compliance with regulations before final permits are awarded. In some communities an occupancy permit, which is the final permit, is not granted until the CEO makes a final inspection to ensure that all requirements have been met.

New Regulations

6. Review local road construction standards and make changes based on rural road conditions. Changes could include reducing the width of pavement required in the right-of-way, allowing for unpaved roads, and requiring surface drainage and control of roadway runoff *prior* to release into streams or other water courses.

In certain cases where contamination or a nutrient load is anticipated, some towns require the construction of detention ponds that hold stormwater for at least 36 hours before release into surface waters. The purpose of such ponds is to allow nutrient uptake by plants in the pond and to allow sediments and other material to settle out. In this way stormwater runoff from building lots and other roadways can be treated. A single detention pond or several ponds can be constructed to handle this runoff depending on the amount of stormwater created. It should be emphasized that these ponds need to be kept wet enough to support the plant life that will provide nutrient uptake.

It should be noted that these ideas have been discussed with the Road Commissioner, and while he understands the stormwater benefits of unpaved roads and reduced widths of paving, he clearly feels that any new or reduced paving standards would require the full support of the Harpswell Selectmen.

2.2. Construction Standards

Observations made during the site walks in the drainage basins associated with each of the four shellfish areas led to questions about surface water quality degradation as a consequence of poor construction practices. These included questions about location of septic systems with respect to surface water bodies, i.e. flowing streams, ponds and wetlands (both forested and unforested). Septic system design must somehow address the need for on-site wastewater disposal while still protecting surface waters (and groundwater), and thus indirectly marine ecosystems from the threat of contamination from wastewater associated pathogens and excessive nutrient loads.

Nitrogen is a concern because, once it enters a water course it will flow uninterrupted, until it is absorbed by plant life, such as algae, or metabolized by bacteria. In overabundance it contributes to algae blooms in coastal waters, possibly altering the structure of the algal community. Under certain circumstances, unnaturally large amounts of algae can reduce the availability of oxygen in the waters and shellfish and other marine life can be seriously affected.

Other long term construction problems include building locations in or adjacent to wet areas. While the building itself may not be located in a wetland, its construction may affect site drainage to the degree that stormwater runoff from one property may drain to a neighbor's property downstream. Wet basements and poor yard drainage may pose long term problems as homeowners further disturb natural drainage patterns in an attempt to eliminate wet areas on their property.

Short term construction problems include a lack of sedimentation and erosion control measures on site. Washed out topsoil was clearly evident on many lots. Uncovered topsoil flowed into nearby streams and onto neighboring lawns on many lots. As heavy equipment was moved on site, it appeared to be aggravating runoff problems by further disturbing uncovered soil. All of the observed sites were well within the drainage area of a significant shellfish flat and, as noted earlier, surface waters were carrying sediments into coastal waters.

It was also apparent that contractors were not properly disposing of trash and debris. Discarded insulation, siding, plastic covers and other items were found strewn around sites. At one project site, it appeared as if the developer had left in "mid stream". No efforts had been made to stabilize the site and sediments from house lots that had not been seeded were running into nearby streams and drainage ditches.

Drainage appeared to be a general problem, especially for some newly constructed residences. While it is difficult to tell from site walk information, it appeared that densities may have been too high in some developments and poorly drained soils could be problematic.

Other construction issues observed on the site walks include:

1* the *placement of septic systems on steep slopes* between houses and the shoreline,
2* basement and building perimeter *drains discharging directly to streams or tidal areas*,
3* construction of dwellings and other *buildings in close proximity to streams*, even in the *shoreland zone*,
4* excessive *tree clearing* near the shore which contributes to "blowdowns" of other trees, and subsequent erosion of the shoreline,
5* "*over-utilization" of lots* - this problem, perhaps the most significant of all, was observed on several sites where large animals were being contained near streams and animal waste was being stored in and around drainage areas. An example of this was observed At one location, a discolored stream was followed for approximately 1/4 of a mile to an area where livestock and manure were kept in the stream's drainage area. There was little, if any vegetation on the property due to its over-use with the result that almost any rainfall event contributed animal waste directly into the stream.

One measure of "over-utilization" is the amount of impervious surface on a site. It is safe to say that the greater the impervious surface the more likely it is that stormwater-associated problems will result. Soils and slope are also important factors. Some soils have greater capacity to absorb stormwater, and steep slopes increase the velocity of runoff and therefore erosion. Impervious surfaces include roofs, driveways, parking areas, sheds, patios, sidewalks, and, in some cases, hard-packed gravel. Golf course-style lawns can be so densely planted that the grass roots function like an impervious surface.

Some towns with sensitive coastal waters limit the impervious surface on lots to a maximum of 5%. The idea is to allow as much stormwater as possible to be absorbed back into the ground. The idea is also to keep the stormwater spread over a large natural area so maximum nutrient uptake and percolation can occur. Percolation of stormwater removes sediments and other contaminants before they reach groundwater.

Solutions

Education

1. Develop a homeowner's handbook for Harpswell residents that is mailed to each property owner. The purpose of the handbook would be to educate each homeowner about how their individual activity impacts Harpswell's marine resources. It should contain information on the value of Harpswell's shellfish resources, why the drainage areas are important in maintaining shellfish habitat quality, and how human activity impacts this resource. The handbook should

also include information on issues such as the application of fertilizer, suggested setbacks for buildings and driveways from streams, why unpaved roads and driveways may be better for the environment, stormwater management techniques, and information on who to call for more information.

2. Contractors and developers should be educated about the special sensitivities of coastal development. Again, the Casco Bay Estuary Project plans to offer technical assistance courses for contractors. If the Project does set up such a program, contractors should be strongly encouraged to attend. Planning Board members and the codes enforcement officer should also attend. Prior to starting construction, it may be advisable to require proof of attendance on the part of the contractor.

Strengthen Existing Regulations

3. The Subdivision Ordinance (Section 5.7) requires that runoff not be increased on a site as a result of new development. However, the Ordinance does not require a TR55 analysis (see Section 3.2.1., p15). The Ordinance also requires that stormwater must infiltrate, be detained or retained so that post-development run-off levels do not exceed pre-development levels. However, the Ordinance does not address the content of stormwater. Moreover, the Ordinance requires that stormwater be discharged to "existing water courses or storm drains." As previously mentioned, stormwater can contain a wide variety of pollutants. Without treatment, such as retention or detention, stormwater can cause serious pollution problems for marine resources.

4. The Subdivision Ordinance also requires that subdivisions of 5 or more lots have the endorsement of the Cumberland County Conservation District. Questions remain about what the District reviews contain, whether site visits are made before, during or after construction to ensure compliance with District recommendations, and if the review criteria include special issues for coastal areas (such as nutrient control, surface treatment techniques, and long term maintenance issues).

5. By all accounts, the work of Harpswell's Codes Enforcement Officer has been very beneficial. If anything, people seem to feel he needs assistance. More thorough inspections during and after construction would help ensure compliance with conditions of approval as well as provide technical assistance to developers. Combined with the homeowner's handbook, such measures often do more than adopting new regulations.

6. Harpswell has a site plan review ordinance and is currently working on a general land-use ordinance. The current site plan review ordinance does not apply to development less than 2,500 square feet. Nor does it account for cumulative development of the same property. Since impervious surfaces near any water body can impact drainage patterns, it is suggested that the Town review the standard that triggers site plan review and further recommend that it be reduced to 500 square feet, especially in areas near water bodies. Also, the present site plan ordinance requires review for paving or stripping of areas over 20,000 square feet. Again, paving one-half an acre can make significant changes to drainage patterns as well as alter the content of surface run-off. The Planning Board and/or the Land-Use Ordinance Committee are urged to consider a review of these standards as they work on the land-use ordinance.

New Regulations

7. Unfortunately, most development that is not part of a subdivision receives limited review. Two things are recommended:

a. a review of the permits required for construction to determine if they request the kind of information necessary to ensure that protection of Harpswell's surface waters and, consequently its shellfish resources, is adequate, and

b. ensure that local building permits coordinate with the forms also required for the Natural Resource Protection Act (NRPA) and the Army Corps.

2.3. Changes in the Intensity and Type of Land-Use

In 1960, the population of Harpswell was 2,032. By 1990, it had more than doubled at 5,012. The jump in households is equally telling as household counts in 1960 were 626, and in 1990 rose to 2,051 - an increase of 227%.

Looking at it another way, Harpswell's total *accessible* acreage is 13,578 acres. We can generalize these numbers and say that the average lot size per household in 1960 may have been 21 acres (13,578/626=21). In 1990 that average lot size has been reduced to 6.6 acres.

Farming has long been a way of life for Harpswell residents, but the use of chemicals and pesticides is a relatively new phenomenon. Further, as site walks showed, animals commonly associated with farms, such as pigs, horses and sheep, are now being raised on what would more appropriately be considered house lots.

While we have always traveled from Harpswell to other communities, we did not make two or three trips a day back and forth. There are more people, doing a wider variety of things, on smaller lot sizes, than ever before in the town. And, because Harpswell functions much like an island, the impact of this activity is quickly transferred from inland properties to the coast.

The site walks showed clear evidence that pressure on land has intensified as old properties have been subdivided. Streams that once drained one or two properties now feel the effects of 20 or 30 properties, each with its own household.

In an interview with Harpswell's Codes Enforcement Officer, he was asked if there were any areas in town that he felt were "over-utilized". He listed three areas: Lowell's Cove, Gun Point, and Stover's Cove. His definition of "over-utilization" included the inappropriate use of septic systems where design flows are being exceeded. For example, at Cundy's Point there are now 4 apartments in what used to be a single family home. Septic systems are often installed without appropriate permits in units that do not conform to the law. One system was found that had no drainfield; the outlet flowed directly onto a dirt pile. So many single family and season homes are being converted to multi-family, year-round homes, that some people are calling it the "commercialization of the shoreland zone."

The minimum lot size in the shoreland zone is 30,000 sq. ft. per unit. However, many residences are apparently being converted to multi-unit dwellings without obtaining the proper permits and in violation of the minimum lot size. When the CEO was asked if he feels the minimum lot size is adequate in Harpswell, the answer was "probably not", if we judge by septic system performance. Currently, the CEO spends 75% of his time working on plumbing code

issues.

Given that pressure on land can quickly be transferred to our marine resources, i.e. shellfish harvesting closures, Dingley Island causeway, how we use the upland becomes more important as our numbers increase. The Town of Harpswell may want to reassess the level of review currently applied to proposed subdivisions as well as other construction activity. The Town may also wish to reassess its stormwater standards to encourage more surface treatment of stormwater before release into water bodies. Equally important, it may be worthwhile educating all households in Harpswell about the basics of good stewardship by expanding upon the award winning work of the Conservation Committee's educational efforts.

Solutions

Education

With regard to intensification and type of land use, the education component should involve gathering more specific information about how these changes are affecting the Town's resource base. The town may wish to create a database on growth and development so that any changes to marine resources can be placed within the context of this information.

2.4. Wetlands - The role of wetlands in protecting and maintaining high water quality

Wetlands were found to be common geological features at all of the four study areas, although the type and extent of the wetlands varied considerably from one area to another.

The most significant true wetlands were found within the Harpswell Cove watershed. A very extensive wetland covering approximately 6.6 acres extends south of Harpswell Cove between Route 123 and the Hildreth Road to within a few hundred feet of the Mountain Road. An open body of water with a surface area of approximately 1.1 acres is at the center of the wetland with emergent grasses covering an additional 5.5 acres. Clearly defined surface water flow enters the wetland at numerous points around the perimeter and account for drainage from approximately 590 acres which include residential, agricultural, and commercial uses. Along the western shore toward the north end of the cove a tidal stream takes a circuitous route through a salt marsh on its approach to the cove. North of the cove drainage enters through another combination of freshwater wetlands and salt marsh area.

Most of Ash Cove is bordered by a narrow marsh band only a few feet wide, but the northern perimeter of the cove consists of marshlands of varying, but significantly greater width, being widest at the very head of the cove. Between the head of the cove and Route 123 there is a somewhat extensive wooded wetland, or swamp, which extends both north and south along the western side of Route 123. The northern section appears marshy or boggy while the southern area appears to have permanent standing water, perhaps with the exception of the driest of seasons, i.e., Summer '95! Based on the presence of lush algal growth in the perennial streams associated with this forested wetland, the area appears to act as a buffer between small-scale agricultural land-use and the receiving marine waters (see related bacteriological sampling and conductivity measurements, Heinig and Newberg, 1994).

Henry Creek is a tidal wetland, extending approximately 1000 ft. south of the causeway. The wetland is bisected longitudinally by a tidal creek. The wetland also receives freshwater

input from numerous streams along both the western and eastern shores.

No specific wetland areas were found in association with the shellfish area south of the Dingley Island causeway. No evaluation was made of the shellfish population in the area north of the causeway, but marshlands does exist along the immediate shore adjacent to the flats.

Clearly, wetlands are prominent geological features found in association with shellfish habitat in the Town of Harpswell. The role of wetlands as buffers between these important shellfish areas and changing upland land-use must not be either overlooked or underestimated. In a very real sense, these wetland areas act as "*shock absorbers*". This reference to shock absorption is most appropriate, particularly with respect to the capacity of wetlands to reduce channelization of surface water flow, thus extending the retention time of water flowing to the shore and providing the opportunity for both physical and/or biological removal or reduction of materials carried by the water, whether suspended or dissolved. For example, although the

deposition of fine sediments onto shellfish areas is necessary to maintain the habitat, excessive sediment loads, such as those often carried by stormwater, could spread a heavy layer of sediment over the shellfish area, potentially suffocating the clams. By their nature, wetlands diffuse water flow, thus slowing the water's velocity, allowing fine sediments to settle before reaching the shore.

Biologically, the diffusion and retention of water extends the residence time of runoff thus increasing the probability of natural die-off of potentially pathogenic bacteria originating from wastewater disposal systems before they enter marine waters. Additionally, wetland plants take up nutrients in their growth, thus offering the capacity of attenuating nutrient loads from agricultural or residential development, loads which, if excessive, can threaten the marine environment in general, and shellfish populations in specific.

The importance of wetlands is generally well recognized and regulations for ensuring their protection already exist. However, the current wetland definitions may not cover certain wetlands within the Town, some of which may be important in maintaining and protecting the water quality of marine waters. For example, a recent evaluation of wetlands in the Town of Harpswell conducted by Woodlot Alternatives, Inc. (Sept. 1995) used the Maine Department of Inland Fisheries and Wildlife rating procedures in its evaluation, a rating procedure appropriate for the requested evaluation. The evaluation, however, while making mention of the functional role played by these wetland areas, appears to be based principally on the suitability of wetlands as habitat for waterfowl and wading birds, neither of which is necessarily appropriate in evaluating the significance of wetlands to the protection of water quality or marine resource habitats. For example, a wetland which includes an open, permanent body of water would likely be rated higher than a bog. But from a functional point of view, the bog may, in fact, afford greater retention capacity (thus affording greater "shock absorption") than the permanent, open water body, the volume of which is constantly maintained by perennial flow. In view of this, the Town should consider measures to protect and perpetuate *all* wetlands associated with significant shellfish areas, regardless of their status under the current wetland definition.

Solution: *Protection and perpetuation of coastal wetlands*

To ensure the continued functionality and perpetuation of the wetlands the Town should take measures to avoid destruction, damage, or disturbance of wetlands associated with

significant marine resource areas. However, before any action can be taken to protect these areas, defensible criteria must be developed to define the physical and biological functional significance of the wetlands. Once developed, the criteria must be applied Town-wide to identify and delineated the boundaries of the coastal wetlands. Finally, specific action should be taken to provide for the protection of the functional integrity of the designated wetland areas.

Specific Actions:

The Town should lobby the State (IF&W, DEP, DMR, Coastal Program) to develop criteria for the evaluation of the functional significance of wetlands associated with areas of marine resource significance.

Based on the developed *functional significance criteria*, the Town should evaluate all wetlands associated with areas of significant marine resources, regardless of type or current classification, specifically and clearly defining the wetland area boundaries.

The Town should develop a set of Protection/Perpetuation alternatives including:

- $ Dry vegetated and/or forested buffer zones around designated wetlands,
- $ Develop a *marine/coastal* wetlands protection zone within which specific restrictions/ performance standards would apply,
- $ Encourage/seek easements around protected wetland areas,
- $ Direct purchase of wetlands,
- $ Purchase development rights within "protection zone" surrounding wetlands

2.5. Implications of Changes to the Maine State Plumbing Code

Rules adopted in 1974, State of Maine Subsurface Wastewater Disposal Rules, Chap. 241 and subsequently revised, required separations or "setbacks", of at least 100' between domestic water supply wells and perennial streams; minimum separations of 50' were required for intermittent streams.[1] For systems designed to replace pre-existing systems that had failed, a variance procedure requiring Maine Department of Health Engineering and/or municipal approval allowed reduction of these constraints to 60' and 20', respectively.

These setbacks were based upon the assumption that the lateral flow of wastewater through unsaturated soil, and fill material placed during system construction would, over these distances, result in pathogen die-off and the reduction of contaminant concentrations to "acceptable" levels. Some data have been obtained since 1974 to test these assumptions and include the definition of nitrate-nitrogen (NO_3-N) plumes up to 300' down-gradient of septic system disposal fields. These plumes had concentrations exceeding 10 milligrams NO_3-N per liter...an unacceptable level according to Maine's Drinking Water Standards. The data were obtained in the field, utilizing existing residential septic systems in relatively permeable soils developed from glacial meltwater deposited stratified sands. (While relatively uncommon, Harpswell does have some areas where the soils are similar to those of the test areas... located in Cambridge, Ontario, Canada.) These results, and other information, indicate that Maine's setback requirements are far from conservative.

Maine's Rules governing the location and construction of septic systems have been revised effective July 1, 1995. Despite the information cited above, these Rules both relax and confuse surface water setback requirements. *Major watercourses*, i.e. blue lines on 1:24,000 scale topographic quadrangle maps require 100' setbacks. *Minor watercourses* i.e. an "identifiable watercourse that is not a major watercourse", will require a setback of at least 50'. Because Harpswell has few blue lines, setback minima of 50' will become more common for new septic systems. Because the blue color shown on topographic maps will be difficult to transcribe to maps showing property lines, it will likely be difficult in some cases to decide

whether one is dealing with a *major* watercourse or a *minor* one.

Observations made in the Henry Creek drainage basin illustrate the impact of the newly adopted Rules. The USGS quadrangle map indicates a blue line along the axial and tidal portion of the marsh. Yet at least one perennial stream, as well as several intermittent streams, drain an area of 181.2 acres and discharge to the marsh. Currently, the Rules governing the design and installation of new septic systems will require a minimum separation of 50' for all of these streams. Should these systems themselves fail, setbacks of only 25' would be required for the systems constructed to replace them.

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[1] intermittent water body. standing or flowing water, resulting from surface runoff or the position of the ground water table, which
occurs for a period of not more than six consecutive months of the year. 10-144CMR, pg. 1.57/80, rev. 1/86,7/87.

The network of surface water within any drainage basin is an efficient potential pathway for the delivery of pathogens and nutrients from failed septic systems to the marine environment and, therefore, to Harpswell's valuable soft-shell clam harvesting areas. The changes discussed here (represented by the latest revisions to the Maine State Plumbing Code) are not consistent with the Town's recent efforts to study, conserve, and protect its marine resources.

Solution

Strengthening of existing regulations

To strengthen the degree to which the Maine State Plumbing Code (or Rules) protects surface water quality, and hence indirectly marine resources, two additional requirements could be adopted by the Town. The Land-Use Ordinance Committee is urged to consider these requirements as they work on the land-use ordinance:

1. The initial installation of a septic system to serve a new residential, or commercial, structure must satisfy all requirements of the Maine State Plumbing Code. (The New System Variance procedure that currently exists would be eliminated; see Rules, Chap. 19, Section 1902.0, p. 79).

2. The setback distance from surface water bodies, required for both septic tanks and disposal fields, shall remain the same as those which existed prior to July 1, 1995. (see Rules, Chap. 4, Section 404.0, pp.21-22.)

3. Site Walk Survey Results

3.1. Dingley Island, East Harpswell

3.1.1. Location and General Description

Dingley Island lies east of Great Island (Sebascodegan Island) to which it is connected by a causeway. It is in the east central portion of the Orrs Island 7.5' USGS topographic quadrangle, in the western part of the New Meadows River. The island has an ellipsoidal shape, the long axis (approximately 6000') being oriented N 10^0E. The area between Great Island and Dingley Island is exposed at low tide and soft-shell clams are harvested in portions of this tidal mudflat.

Much of the shoreline is exposed bedrock with relatively steep, spruce forested, slopes extending inland. Small, generally poorly defined, intermittent streams drain the area (about 35 acres) to the west, discharging along the eastern shore of Great Island *opposite* Dingley Island. The drainage pattern in detail is complex. Numerous topographic depressions exist separated by areas of exposed bedrock. These topographic irregularities give rise to a mosaic of very small sub-basins.

Except for a small area along the shoreline of silt loam soil derived from fine-grained marine sediments, the area is covered with a thin veneer of soil derived from the weathering of glacial till. Identified as *Lyman very rocky fine sandy loam* (LzB) in medium intensity mapping by the Soil Conservation Service, the soil is further described as follows:

> *This Lyman soil can be used as permanent pasture and woodland. Balsam fir, white spruce, and white pine are suitable for planting but seedling mortality is severe. Also, the windthrow hazard is moderate because of the shallowness to bedrock, and equipment limitations are moderate. Shallowness to bedrock very severely limits all community uses. Shallowness to bedrock and many rock outcrops severely limit most recreational uses.*

3.1.2. Shellfish Habitat/Resources

The shellfish flats on either side of the causeway between the mainland and Dingley Island had never undergone a formal survey prior to 1995. A survey was reportedly conducted in the area during the Summer of 1995, but results of the survey are not currently available. A cursory, "walk-over", survey was conducted by members of the technical consulting staff on 15 Sept. 95 of the area south of the causeway. Although soft-shell clams also populated the area north of the causeway, time constraints did not allow a survey of that section of flats.

The populated shellfish habitat extends approximately 1750 feet south from the causeway towards open water. At its widest point, the populated habitat is 250 feet wide, but the average width is closer to 150 feet, thus yielding a total populated area of about 6 acres. The first 300 feet south of the causeway consist of a 8-10 inch deep layer of soft sediments overlying a hard-packed substrate of relic shell (possibly remains of a pre-causeway population). This section of the flat supports a moderate-sized population of large, legal-size clams which is difficult to detect from surface observations alone, i.e. few siphon holes showing.

Over the next ~1200 feet, heading south, the clam population increases steadily, although remaining thin along the banks where clay erosion results in rather soft sediments.

Below a series of rocks near the middle of the cove (first ~600 ft.) the population becomes dense with representatives from several year classes, suggesting consistently high recruitment in the area. Most of the clams are small and sub-legal (<2 in.), but this may be due to harvesting of the area, evidence of which was seen during the survey. In the upper portion of the middle section the clam population is concentrated in the center of the flat, thinning out towards the shores. In contrast, in the lower half of the middle section the clams are found predominantly along the shores, diminishing in number toward the center where sediments become soft and support a large number of maldanid (bamboo) and nemertean (ribbon) worms. Numerous predatory snails, *Nassarius* sp., are found in the center of the flat, expanding towards either shore as one proceeds seaward.

The trend towards concentration along the shorelines continues over the remaining ~250 feet of populated area. Sediments in the center of the flat become progressively softer with increasing numbers of maldanid (bamboo worm), probably *Clymenella* sp., and nemertean (ribbon worm), *Cerebratulus lacteus*, worms, bloodworms, *Glycera dibranchiata*, and numerous razor clams, *Ensis directus*. Interestingly, however, the substrate beneath the several inches of soft mud is hard-packed relic shell, suggesting that at sometime in the past productivity in the area was very high and covered a significantly greater area than at present. The reduction in the spatial extent and density of the resident clam population may be attributable to the installation of the causeway.

3.1.3. Summary of Current Land-Use Conditions

Dingley Island Road is bounded principally by large, wooded lots, ranging from just over 6 acres to the 55.4 acre Rand Island Trust property. Based on visual observation, land use on the Dingley Island Road, and on the Island itself, is residential in nature. Dingley Island Road bisects the island creating a northern and southern half. Residential densities and amount of tree coverage is quite different, with the northern half being more densely and recently settled with greater amounts of tree coverage.

The northern half of Dingley Island has newer residences on lots averaging about 2.5 acres some of which have steep, rocky slopes. At present not all lots have residential structures, but it can be assumed that the subdivision will be built out over time.

The southern tier of Dingley Island is composed of about 6 lots which vary in size with the largest parcel being over 45 acres and the smallest around 7200 sq. ft., or 0.165 acres. Some of the residences are newly constructed, others appear to be conversions of large, seasonal units. A fresh water pond is situated in the north portion of the southern most lot which is also the largest lot on the Island. Most of trees on the southern half of the island have been cleared, leaving field and lawn.

On the mainland, the section north of Dingley Island Road is relatively undeveloped, but the area south of the road, along Lower Spruce Shore road has been developed into residential lots of just over 2 acres in size. Concern has been expressed over the fact that much of this land is steep and rocky and drains directly into the tidal, harvested shellfish area between the mainland and Dingley Island.

3.2. Henry Creek

3.2.1. Location and General Description

Henry Creek is a northeasterly flowing stream which empties into the southern part of Long Reach in the central portion of the Orrs Island 7.5' USGS topographic quadrangle. Tides affect the lower 2000' of the stream. Above the tidal limit is an unforested freshwater wetland of approximately 3.5 acres. Several intermittent streams and two perennial streams discharge into the wetland. Henry Creek and its tributary streams drain an area of 181 acres which is bean-shaped. Within that drainage area is a sub-basin of 73 acres containing a stream approximately 2100' in length. On May 6, 1995 the discharge at the mouth of Henry Creek was estimated to be 5-8 gallons per minute. Approximately half of this flow was estimated to be contributed by the tributary stream noted above. To the west, within the drainage basin, slopes are gentle. The vegetation is a mix of soft and hardwoods supported for the most part by Buxton and Scantic silt-loam soils.

The sub-basin was examined in detail utilizing 1994 aerial photography in order to assess the impact of recent residential development upon the drainage, and more specifically runoff from the land. Eight (8) houses occupying approximately 2 acres each are located within the wooded 73 acres. The Doughty Point Road, and Henry Creek Way, neither of which are paved at present, represent 2.4 acres and provide access to the area for residents. Their driveways utilize another 0.4 acres. *Cleared land*, primarily lawn and grassland accounts for 1.9 acres; the impervious roofs of houses and garages another 0.4 acres.

Following a methodology developed in *Urban Hydrology for Small Watersheds*, United States Department of Agriculture, Soil Conservation Service, Engineering Division, June 1986, referred to as Technical Release 55, or TR55, runoff curve numbers can be estimated for forested watersheds such as the sub-basin discussed above. As residential development occurs, and land is cleared, the nature of the land surface changes. Changes in runoff curve numbers indicate the extent to which runoff from the land increases as a result of these changes. Calculations show that the development to-date has had little effect upon runoff curve numbers. If the remaining 55 acres of the sub-basin are developed in a similar way i.e., 2 acre minimum lots with little *clearing* of land, the impact on runoff will continue to be minimal. It should be noted that this analysis does nothing to address questions of how the *quality* of surface water may be impacted by residential development and certain land-use practices.

3.2.2. Shellfish Habitat/Resources

Clams are harvested at the mouth of Henry Creek and in a crescent shaped area of 6.7 acres extending south of the Creek along the precipitous (slopes within 250' of the shoreline are up to 50%) west shore of Long Reach. Henry Creek itself has never been surveyed as part of the routine, three-year rotational survey of Harpswell's shellfish areas since it is relatively narrow and offers little soft-shell clam habitat. However, the area immediately adjacent to the opening of Henry Creek on Long Reach Cove represents one of the top four most productive areas in Town according to a survey of licensed Harpswell shellfish harvesters (refer to Appendix I).

In 1990, a survey of 13.8 acres of Long Reach Cove, representing the most productive section of the cove, yielded a total standing crop density of 56 bushels per acre, or 778 total bushels. The legal-size population within the area had an estimated density of 31.8 bushels per acre, or 440 bushels. After reseeding the area in 1991 as part of Harpswell's Shellfish Conservation Program, the area was once again surveyed in 1993. This survey revealed that the soft-shell clam population had expanded to cover 32.8 acres. The total standing crop

density had increased to 87.3 bushels to the acre, for a total standing crop of 2859 bushels, 83.7% of which represented legal-size clams, accounting for 2392 of the total bushels production.[2,3] This represents slightly under twice the average production from Harpswell flats, thus corroborating the shellfish harvesters' high raking of the area's importance to Harpswell's shellfishery.

3.2.3. Summary of Current Land-Use Conditions

Doughty Road, which leads into the Henry Creek residential subdivision, is a long, unpaved, private access way. The road is bounded on either side by large, wooded lots, with residences interspersed. Many recorded lots appear to be unbuilt at this time. There are a number of large parcels on Doughty Road located to the south of the Henry Creek subdivision. These parcels may be subdividable at densities similar to those of Henry Creek.

The western portion of the subdivision has approximately 24 lots, with lot sizes ranging from about 1.9 acres to over 5 acres. As a result of grading for foundation, it appears that the lawn area around many houses may be wet during part of the year. A number of unfinished structures and construction debris remain on lots. The land around residences is a mix of lawn and wooded area.

The western portion of the subdivision is bisected by numerous small streams and wet areas. During the site walk it was discovered that a number of property owners had dealt with their own drainage problems by carving out trenches in their lawns. These trenches led to a stream running between lots and draining into the Henry Creek wetland.

Four large parcels are found at the northern edge of the subdivision. These parcels are apparently in tree growth tax status. The lots are largely wooded with some steep slopes which drain into the northern section of the wetland and into Long Reach.

The eastern portion of the subdivision is bounded by Long Reach and the Henry Creek wetland. These lots are bisected by an unpaved road that runs down the crest of the area. The lots are carved out of wooded ledge and are quite steep in places. Again, not all lots have been built upon. Like the rest of the subdivision, much of the land has been stumped, with the brush and slash remaining. No sedimentation or erosion control is in place.

3.3. Ash Cove, South Harpswell

3.3.1. Location and General Description

Ash Cove is located in South Harpswell. In part it is within the Orrs Island 7.5' USGS topographic quadrangle; the southwestern portion is on the Harpswell 7.5' quadrangle. The Cove is oriented N35^{0}E; its long axis being approximately 2600'. It is 400' wide at its head (i.e., where a clam flat is located) and widens gradually to a width of 1400' near the southwestern end.

Bedrock outcrops along most of the shoreline from Ash Point to the mouth of Ash Cove. Away from the rocky shore a thin veneer of soil covers rock surfaces. For the most part, the soils are gravelly and are derived from glacial till. However, a much "gentler" shoreline exists at

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[2] Shellfish Survey Report 1990, Town of Harpswell, Intertide Corporation, 1991

[3] Shellfish Survey Report 1993, Town of Harpswell, MER Assessment Corporation, 1994

the head of the Cove and along its eastern and western shores. Here there is a general increase in soil cover. Silt loam soils, and some areas of Windsor loamy sand soils (head of Cove and eastern shore), have been mapped by the U.S. Department of Agriculture, Soil Conservation Service . The latter soils are excessively drained and have high permeability. They are derived from glacial outwash deposits.

Roads (Route #123 and Ash Point Road) closely follow the drainage divides along the peninsulas east and west of Ash Cove. Streams, although numerous, are small and response of the streams to heavy precipitation tends to be "flashy" due to their short lengths. Discharge increases rapidly during and/or immediately following the rain, but it decreases rapidly in the 24-36 hours after a storm event. The area northeast of Ash Cove shows less rapid "decay" of high rates of discharge due to the greater permeability and water storage capacity of the soils and underlying sediments. In Spring, the water table is close to surface and numerous springs and seeps exist where groundwater is discharged to surface sustaining prolonged, and in some cases perennial, run-off (see Heinig and Newberg, 1994, Figure 5-3).

The shellfish area in Ash Cove is not protected by any special land-use restrictions. It is, therefore, unlike its counterparts in the west-central part of Harpswell Cove and in Long Reach near Henry Creek, where Resource Protection Zoning and Natural Resource Protection Act permit requirements protect contiguous, or nearby, wetlands. The shoreline immediately northeast of the shellfish area in Ash Cove is zoned as Shoreland. Yet springs and small wetland areas exist just beyond the landward limit of this zone (250' from normal high water). These springs could already be impacted by failing septic systems and by small-scale agricultural use that effects groundwater upgradient of them. The assimilation of excess nutrients and the attenuation of pollutants in the discharging groundwater must occur over the short distances between the springs and the discharge points at the head of the Cove of the small streams they spawn.

These small streams, and their associated wetland areas qualify as "sensitive areas" as discussed in the 1993 revision of the Harpswell Comprehensive Plan, January 1993, pp. 46-47. They are at present protected only by the Shoreland Zoning Ordinance adopted by the Town of Harpswell in March, 1992, and subsequently amended in March 1993, March 1994, and June 1994.

3.3.2 Shellfish Habitat/Resources

Ash Cove was surveyed in 1988 and again in 1991. In 1988 the clam population covered an estimated 6.4 acres of the intertidal area at the head of the cove. By 1991 the populated area had been reduced to 5.5 acres. Production in 1988 was estimated at 567 bushels, 402 of which represented legal-size clams. In 1991 the total standing crop was estimated at only 206 bushels with 171 of these representing legal-size clams.[4,5]

A survey of this area was reportedly conducted in Summer 1995, but no information from the survey is currently available.

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[4] Shellfish Survey Report 1988, Town of Harpswell, Intertide Corporation, 1989

[5] Shellfish Survey Report 1991, Town of Harpswell, Intertide Corporation, 1992

3.3.3. Summary of Current Land-Use Conditions

Land-use in Ash Cove consists of a mix of institutional (school and church), service business, home office, commercial, and marine related activities, although the majority of structures are residential in nature.

The northwestern portion of the Cove is bounded by Ash Point Road. Ash Point Road services a church, an elementary school and a number of residences. Most of the residences are on lots located on the western portion of the road (away from the Cove). These lots vary in size. A large boatyard dominates the western most lot.

On the cove side of the road, large scrub fields dominate the landscape following the elementary school at the corner of Route 123 and Ash Point Road. These fields give way to large wooded residential lots that range from 3 acres to 10 acres.

The northeastern section of the Cove is bounded by Route 123. On the cove side of Route 123, much of the land is low lying and wooded. As the ground begins to rise, single family house lots are found. One of the residences appears to have domestic animals in a small barn as well as a home business.

The eastern side of Route 123 (away from the Cove) has a mix of old and newer single family residences. Some of the structures may be seasonal, others have been converted. The land behind many of these structures is wooded. Some pasture and field are found on the eastern portion of Route 123, where it meets Ash Cove Road.

3.4. Harpswell Cove

3.4.1. Location and General Description

Harpswell Cove lies at the head i.e., the northeast end, of Harpswell Sound, with the peninsula of Harpswell Neck to the west and a part of the Town of Brunswick (the Princes Point peninsula) to the east. The Cove is thus partly in the Town of Brunswick, and partly in the Town of Harpswell. Harpswell Cove is located in the north central portion of the Orrs Island 7.5' USGS topographic quadrangle. The Cove is generally u-shaped, opening to the southwest. It is up to 3,000' wide and approximately 12,000' long. Thus it has the same ratio of width to length as Ash Cove.

Surface water flows to Harpswell Cove from a large drainage area located to the north, east, and west, and southwest of the Cove. For this Project detailed observations of the drainage and land-use characteristics were made only in the area to the southwest, i.e., along that portion of Harpswell Neck lying just west of a portion of the commercially harvested shellfish area within the Cove. The most important stream in this area begins just north of the Mountain Road and flows northeasterly for approximately 4000' before discharging to the Cove. The stream has been ponded in several places at various times by man and beaver. In its upper reaches the stream lies within a forested wetland. This is succeeded downstream by an unforested wetland (approx. 5.5 ac.) which extends for distances up to 200' east and west of a ponded (approx. 1.1 ac.) section of the stream.

In all about 590 acres lying both east and west of Route #123 are drained by this system. The relatively large size of this sub-basin, and its wetland *fringe*, increases the retention time of water and its suspended and dissolved constituents. This maximizes the effects of chemical and
biochemical responses within the freshwater system which tend to counteract sudden changes resulting from certain uses of land within the drainage area. The system tends to act as a *shock*

absorber for Harpswell Cove, helping to protect it from potential negative impact of land-derived pollutants.

Other streams, fed in part by stormwater runoff through culverts beneath Route #123, and driveways along it, discharge directly to Harpswell Cove. Travel times from source to discharge point along many of these streams are short.

3.4.2. Shellfish Habitat/Resources

Harpswell Cove was found to be the largest and potentially most productive of the four study areas based on the size of the available habitat and apparent productivity. The main intertidal area of the cove (small tidal inlets not included) measures approximately 3500 feet long by 1000 feet wide, thus covering an area of roughly 80 acres. Based on the cursory survey conducted on 13 Sept. 95, it is estimated that a little more than half of this intertidal area, perhaps 40-45 acres, is currently populated by soft-shell clams.

The northern section of the flat is bordered by marshlands dissected by several tidal streams which persist across the mudflat throughout the tide cycle. The northernmost extreme of the flat consists of fine sediments supporting a large population of polychaete worms. Predatory snails, *Nassarius* sp., were found to be plentiful in this area. No clams were found in this area and it is unclear whether this absence is due to sediment type or possible predation.

The central portion of the mudflat supports a large population of clams, sufficient to rank this area as one of the more productive shellfish areas in the Town. Most of the clams, however, are small in size (sub-market) due to recent harvesting evident at the time of the survey. Current harvesting is restricted to a relatively small portion of the flat adjacent to the principal tidal inlet on the western shore, although areas of earlier harvesting were found elsewhere on the flat. Beyond this area to the south, and extending to the vicinity of the rocks in the middle of the flat, the population is extensive, albeit spotty, consisting of dense patches of predominantly small clams. Seaward of the rock outcrops the sediment becomes finer and supports a large population of maldanid polychaete worms, probably *Clymenella* sp., and nemertean "ribbon" worms, *Cerebratulus lacteus*, the latter being predators on clams. From the center of the population concentration towards the western shore the sediment becomes increasingly hard, eventually consisting of a 3-4 inch layer of soft sediment overlaying a dense, hard-packed substrate of relic shell. Although a large number of small clams is found along the western shore, the density of the underlying substrate may preclude these clams reaching market size.

Further to the south there is an area covered with seaweed, *Fucus* sp., in which some clams are found, but the population is significantly less than in the previously described central area. Beyond the seaweed area, continuing south, the sediments again become soft and the clam population diminishes.

A survey of the area was reportedly conducted in the early summer of 1995 and evidence of two possible survey lines (as sticks and branches stuck in the mud approximately 100 ft. apart) were found in the center of the flat. No information is currently available from these survey efforts.

3.4.3. Summary of Current Land-Use Conditions

Harpswell Cove contains the largest number of lots as well as the greatest mix of uses. While the predominant use is residential, there are a number of commercial businesses

including a variety store, an auto shop, shellfish sales, service-related businesses, and agricultural and livestock uses. Lot sizes in the Cove area are widely varied with some lots less than an acre and others totaling several hundred acres.

Site walks in the Harpswell Cove drainage area showed several instances of pollution. Discoloration, erosion and sedimentation of streams were found in a number of areas around the watershed. Route 123, which forms a westerly boundary for the Cove, is a heavily traveled road and receives a great deal of salt and sand as part of its winter maintenance. Evidence of sedimentation and erosion was found along Route 123. Poor construction and maintenance of storm water drainage was found along private roads where detention ponds had been dug around culverts which discharged into nearby streams. Clear evidence of stream bank erosion was found. It appears that long term maintenance of stormwater systems on some private roads will be problematic.

Some of the northern portion of the Cove is located in Brunswick. Land use in this area is residential and agricultural, with large pasture and field as well as wooded areas. This area was not included in the site walk.

APPENDICES

APPENDIX I

Shellfish Harvesters Shellfish Area Rating

Shellfish Harvesters Shellfish Area Rating

At the June meeting of the Harpswell Marine Resources Committee the harvesters present at the meeting were asked to rate all 43 shellfish harvesting areas in the Town on a scale of 0-3, 0 being totally unproductive and 3 highly productive.

Results of this exercise are tabulated in the Table following. Of the 43 areas, four (4) were considered to be highly productive ("3"), only one (1) slightly productive ("1"), and the remaining 38 moderately productive ("2").

It should be noted that diggers often show preference for selected areas, that is, they tend to dig in their *favorite* areas. When rating the 43 areas, diggers appear to have rated areas unfamiliar to them as "2" or moderately productive. Since the 26 respondents probably represent a random subset of all diggers in Harpswell, it is reasonable to assume that not all of these diggers tend to favor the same areas. Consequently, given the tendency to score an unfamiliar area as "2", it is not surprising that the majority of the areas scored "2". To avoid this in any future attempts at rating, diggers might be asked to score *only those areas with which they are truly familiar* (some diggers actually *did* leave blanks in certain cases).

Finally, care must be taken with the names of coves. In the following table Mill Cove is found twice (there are two areas referred to as Mill Cove in Harpswell). In the first case it is rated "2" with an actual score of 2.17, and in the second instance again "2", but with a lower actual score of 1.74. It is difficult for the uninformed reader to distinguish between these two Mill Coves and determine where they are. It is reasonable to assume that this may have caused some confusion for respondents. Similar situations exist with Diamond and Big Diamond, and Hen Cove and Hen Island.

APPENDIX II

Meeting Minutes and Correspondence

Meeting 7-19-95 4:30P Don, Amy, Chris

Amy - observations during site walks + discussion at general meeting

Have a series of meetings with specific audience (planning board, road comm., codes enforcement, etc.) - use record of meeting as a part of the final report (include formal minutes of the meetings plus our own notes).

1. Road construction and maintenance: - Amy

Private/public roads

Road Commissioner in charge of municipal roads, but what kind of review takes place on private roads?

Are there any specific road standards (in the US) for shoreline areas adjacent to significant shellfish areas?
Do standards exist in Harpswell at this time and are they being enforced?
Does the State DEP/DOT have road standards that should be met?
Does the road commissioner visit each road association road to insure compliance with standards?
Rights-of-way: how is width of r-o-w determined; are they presently used during site review in Harpswell?
Need to develop new road standards for rural roads re: width, drainage
i.e. Clark Cove road is paved, altered unilaterally with no input from the Shellfish Commission
"Paper" street - i.e. streets existing on paper which do not currently exist on the ground - surveyed r-o-w which exist legally, but alteration/modification/ improvement of the r-o-w fall under what standards?

2. Construction Standards for Buildings - Public/Private construction - Amy

Residential, commercial and other new construction standards

a. Level of public sector review
b. Private application of public construction standards?
i.e. TR-55,
How are private builders/contractors aware of construction standards? do they appear in the subdivision ordinance? are they adequate and how are they currently being enforced?

Sedimentation/erosion control; lot sizes; placement of structures; septic systems near water bodies;

3. Land Use and Intensity of Land Use - Amy

Current land uses have probably been around for a while (i.e. farming, garages, etc.) but the intensity of these uses and multiple uses on individual lots has increased.

are we concerned with erosion/sedimentation, nutrient loading - how do these things apply or relate to the marine resources.

Comp Plan does not say much about zoning or land use regulation.

4. Changes to the Maine State Plumbing Code - Don

"If it isn't blue...." How will the Town be affected by these changes and how will deal with the changes. Who will be sufficiently knowledgeable to critically review the Code from Harpswell's perspective. Does this fall into construction standards or intensity of land use? Will the Town develop its own classification of streams to provide adequate protection where the ME State Code falls short *(on a site by site basis)*.

5. Wetland "Shock Absorber" - Chris

Review work by Woodlot Alternatives and relate finding to shellfish/marine resources
Need to make general public aware of the role of wetlands as buffers and "shock absorbers" of impacts from upland development.

Recommendations can take the following forms (range):

Education
Regulation
Reevaluation of existing regulation

For specific meetings:

Identify and Articulate Observed Problems

Document observed problems through citation of site walk observations

Clearly state recommendations as a range: "light touch" approach such as education, information through strict regulation.

How do all of the problems tie directly to shellfish resources

Next meeting: July 26th @ Amy's 4:30P

Meeting 8-28-95 9:00A-12:30P @ Amy's Don, Amy, Chris

We need to review the Letter of Agreement and clarify the extent of our involvement in each task.

According to the Letter of Agreement between Harpswell and DEP, technical staff is required to complete Task D, but ordinance development rests with HCC and the Planning Board.

Road Maintenance:

Call meeting to include:
Webber (Road Commissioner), Roland, DOT rep.
What training do local road crews receive? What should they learn?
"Reclaim" as an alternative to paving (reduced imperviousness).
Are current standards for private roads adequate?
Amy will rewrite parts of this.

Construction Standards:

Add 6. Second inspection of septic system installations - Strengthen Existing
Major and minor water courses - define as perennial, intermittent streams (Don)
Don will rewrite part of this. p.6.

New Regs: Amy to clarify difference btwn site plan review and building permit info.
Review current building permit to determine if adequate information is being requested

C. Changes in Intensity and Land-Use

Get: # people, # households, # parcels, # automobiles registered
Get copy of Woodlot Alternatives report - can't seem to find it in the Town Office

Final Report

Take draft and add:

Don's watershed/drainage area maps discussion
Ash Cove shoreline survey
Shellfish area "Priority" listing

Are current DMR sampling stations correctly sited given development around the area
Delineate populated shellfish area: Harpswell Cove and Dingley Island

Hierarchical Reference made to

I. Town
II. Planning Board
III. Others (Conservation Commission, Marine Resources, etc.)

NOTE: Conservation Comm. mtng Sept. 13, 7:00 (?)

Next meeting Tues Sept. 5 9:00 @ Amy's

Meeting September 8, 1995
Roland Mayo, Don, Amy, Chris

Some areas are obviously **over-utilized**: Stover's Cove, Gun Point,

Gun Point - appartment addition
4 apts in single family house - CH

single fam on 1/2 ac OK, "art studio" now with flush being used as dwelling,
Times Record ads for non-permitted apartments in Harpswell

30,000 sq.ft. in shoreland zone inadequate
rules being stretched to help client - new or replacement systems (Card Cove) - site evaluators starting to get upset with hard nosed approach
70% of RM time spent on wastewater disposal system
need ordinance to set fines for failures - heavy fines to promote initiative on part of owner.

violating code to make money -DN winter rentals "Private profit at public expense"

Non-residential >2,500 sq. ft. structure triggers site plan review.

Land use ordinance has now undergone 14 reviews; currently no review process. i.e. body shops

Current revised Plumbing Code inadequate for Harpswell - suggest developing local language:

Concerns: ***grey area on who can obtain a plumbing permit*** - i.e. contractor/owner(?) put's in plumbing, wife/owner installs plumbing

placement of disposal systems in ditched area (drainage ditch) if leaching occurs - direct shot; placement near steep slopes; overboard systems replacement on 37 degree slope.

Article for next Town Warrant to retain current code or make new recommendations:
How to go about this?
What if we, HCC, HSC, etc. develop language with Roland's help
RM suggestion: Include plumbing ordinance in land-use ordinance

Planning Site Plan Review:

Original garage at Morgan's should have undergone site plan review, but requirement was never enforced. Thus, Morgan's expansion first Site Plan review by Planning Board.

Steep slopes - wastewater *and* structures

75 foot setback from tributary stream, had been removed from shoreland zoning, RM put back in.

CCSWCS - Roland recommends use by Planning Board, but not currently used.

Building Permit Application:

OK for building purposes, no glaring omissions - probably could be improved, need to have applicants complete totally, honestly

August 1, 1995
to: Amy and Chris
from: Don
subject: Harpswell Marine Resources Protection Project

1.) Road Construction and Maintenance..On this issue (issues) I can think of little to add to what Chris put in writing during our meeting on 7/19/95. I think we should formalize our list of questions, meet with the Road Commissioner and Codes Enforcement Officer, and then write a summary with/or without commentary..depending upon our success in getting these problems aired. The *commentary* could be addressed to the meeting participants and/or others (?)Incidentally, we are viewing roads and their construction from the point of view of possible (and probable!) negative impact upon the quality of surface water run-off and so of potential harm to marine resources. The Comprehensive Plan viewed roads in a different way ... see attached copy of page 34 from the Plan.

2.) Construction Standards for Buildings..There is no building code in Harpswell, and, of course, no zoning. Individuals can do as they wish; only individuals who subdivide land into a certain number of pieces are constrained i.e., to the extent that the Subdivision Ordinance requires them to maintain certain standards, etc., and/or Maine's Site Location of Development Law is applicable It is interesting to ponder whether occasional big *insults*, or the cumulative effect of incessant small ones, is a more serious problem from a marine resource protection point of view. I think we need to review..and propose revision of.. Harpswell's *Building Permit.*

3.) Land Use and Intensity of Land Use..Harpswell has a leash law. We license dogs. I believe we should register *farm animals*. It might be appropriate for the registration form to require a nitrogen loading calculation (in terms of a template provided on the form). I have thoughts about how to do this. Because we require developers to deal with the issue of solid waste disposal, we should require the same of those who *keep* these other, non-human, organic waste generators. (I hate to point fingers, but I'm not sure that the Town's "ranches" could satisfy a nitrogen loading quota.)The Plan has much to say about land use. (I recall discussions similar to those the three of us seem inclined to have.) I have attached pages 17-24 of the Plan for reference.

4.) Changes to the Maine State Plumbing Code..Whether we act or not I may submit a Warrant Article or two for the March Town Meeting to the Selectmen (after consultation with Roland). I doubt that the *major* vs. *minor* watercourse designation, and the associated setback requirements for septic systems, really afford the resource protection Harpswell needs. Our water-shed maps are useful illustrations!! I also will argue that new system variances not be allowed.

5.) Wetlands.. We need to find out what's been said. I dunno, me.. I mean re. wetlands

Notes from interview with Roland Mayo, Harpswell Codes Enforcement Officer
September 8, 1995

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Roland's sentiment that cooperation on the part of development is

Notes from interview with Mike Webber, Harpswell Road Commissioner
September 18, 1995

MW has been road commissioner for 4.5 years. The position is an elected one and has always been that way.

Mike's dad was road commissioner for 18 years, and Coombs(?) was for 23 years before that. Harpswell has nearly half a century of road commissioners in 3 people and 2 families.

he used to be able to go home at 11:00 pm on the night of a storm and not get called until 2 am. now, he cannot stop, 24 hours a day.

town uses a lot of salt, partly to avoid plowing. not as much snow in this coastal town.

roads should be repaved every 7-8 years. some roads in Harpswell have not been paved for 12 or more years-just a lot of patching.
the state often paves over bad culverts and then has to come back and redo.
ditching-culvert prep in year 1. then come back and hydro-seed and final pave in year 2. this means you go one season with hay mulch on the disturbed soil.

erosion and sedimentation control is a matter of economics. last year, 50% of Webber's budget was spent on ash point. some roads are wider that the r.o.w., so ditching has to be fairly steep. i.e. giant staircase. it is MUCH quicker to use a grader to dig ditching. can ditch a 1 mile a day with a grader. with a backhoe, the slope of the ditch is less but it can only do 1,000 foot in a day.

Webber prefers cleared r.o.w. to allow maximum exposure of sun for thawing. he wants 2 buses to be able to pass each other easily on the road. mike says narrower roads are not safe. if public wants to go fast (and they do), he must have maximum clearance.

Webber emphasized public policy requires him to use more salt than he would like and to have maximum clearance. he says a lot of people want to be able to drive in the winter in the same manner they drive in the summer. also, the sheriff's dept. wants to reduce their liability so they will call him at the end of the night shift, i.e. 2 a.m. and list the roads that need attention-even if they haven't been out to see the road. they just want to absolve themselves of the responsibility and can do so by calling in and reporting it.

mike has 10-12 crew. his dad had 8 max. lots of changes. mike used to stand at the end of the road waiting for the school bus on Cundy's harbor road(?) and see 5 cars go by. he knew them all. now, he stands there and 100 cars go by and he doesn't know 5.

what happens to contaminated sand and salt. he generates 700-800 tons a winter. Jennie asks about salt water intrusion in wells and mike says, no complaints really. and people want that much salt used.

he has heard of Maine local roads program, but has not gone. he thinks the town should require it as part of his contract if they want him to go. issue is pay. none of his crew has been trained in the program either. his crew has 3 years minimum experience. some people have been with him for 20 years.

He has used re-claim and likes it fine. Webber emphasizes the importance of doing the basics, getting the foundation in rather than just patching. better in the long run and less expensive.

He doesn't think the general public will pay for added environmental stuff. his crew just wants to DO. they have to see the need for the new requirements. don't want engineers and other experts to tell them how to do their job if they haven't been out in the field. Still, he would be willing to participate in putting together an educational program for crew.

He thinks the liability issue is getting worse. complaints from the public are getting worse. lots of the complaints come from people who are elderly, who are new in town and just want things to be done the way they were in Connecticut. Webber may not continue to run for the road commissioner job.

Addenda:

Site walks in some areas of Harpswell showed long and short term site degradation as a result of poor construction practices. For example, the potential for long term damage was found in the form of septic system placement within the drainage area of intermittent and perennial streams and wetlands. This is a concern because pathogens and nutrients can pass easily from upland areas to the shore once they enter flowing water. In certain cases septic systems were located within 30 feet of streams. While the septic system itself may not have been in the water, the short distance from the leachfield to surface waters is probably contributing nitrogen, and possibly bacteria, to marine waters and adjacent shellfish flats.